Using Marine Heatwave products for Management

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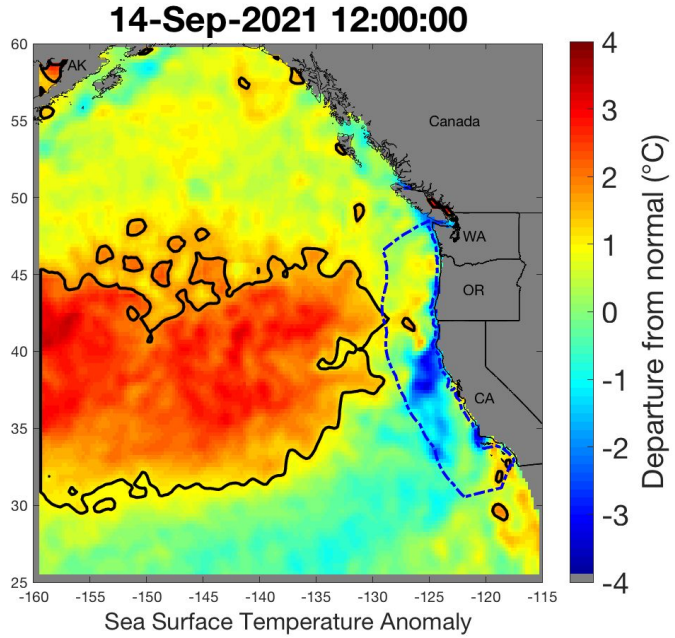

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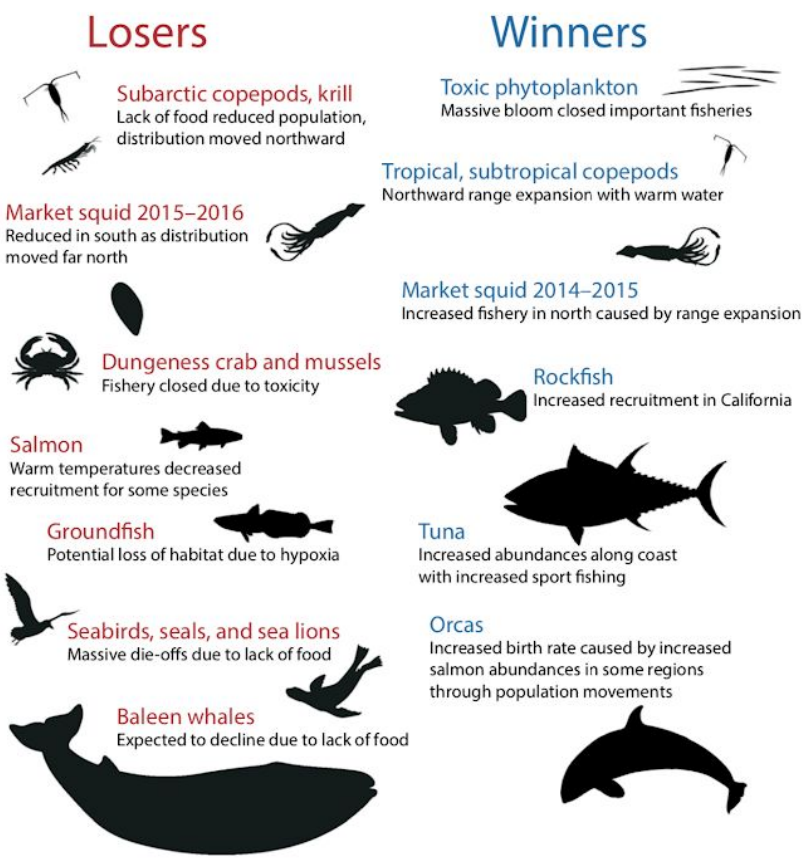
Photo by Abner Kingman

Andrew W. Leising,
NOAA-SWFSC, andrew.leising@noaa.gov

History of Marine Heatwaves - fisheries POV:



"The BLOB" hits the coast of Oregon in Sept, 2014, and puts Marine Heatwaves on the RADAR!

Had a wide range of impacts on marine life (Cavole et al., 2016 diagram)

Understanding potential impacts of MHWs on fisheries becomes a research priority

Developed the "Blobtracker" website and some associated indices for an array of management entities as part of NOAA's Integrated Ecosystem Assessment (IEA) program

www.integratedecosystemassessment.noaa.gov

“Blobtracker” @NOAA’s Integrated Ecosystem Assessment (CCIEA)

Q: What is it? A: Website with products and data

Daily update of SST anomaly, weekly updates of various “products”

Twice monthly update of running “blog” narrative of current conditions

Typically the #1 viewed site for all of the IEA web pages

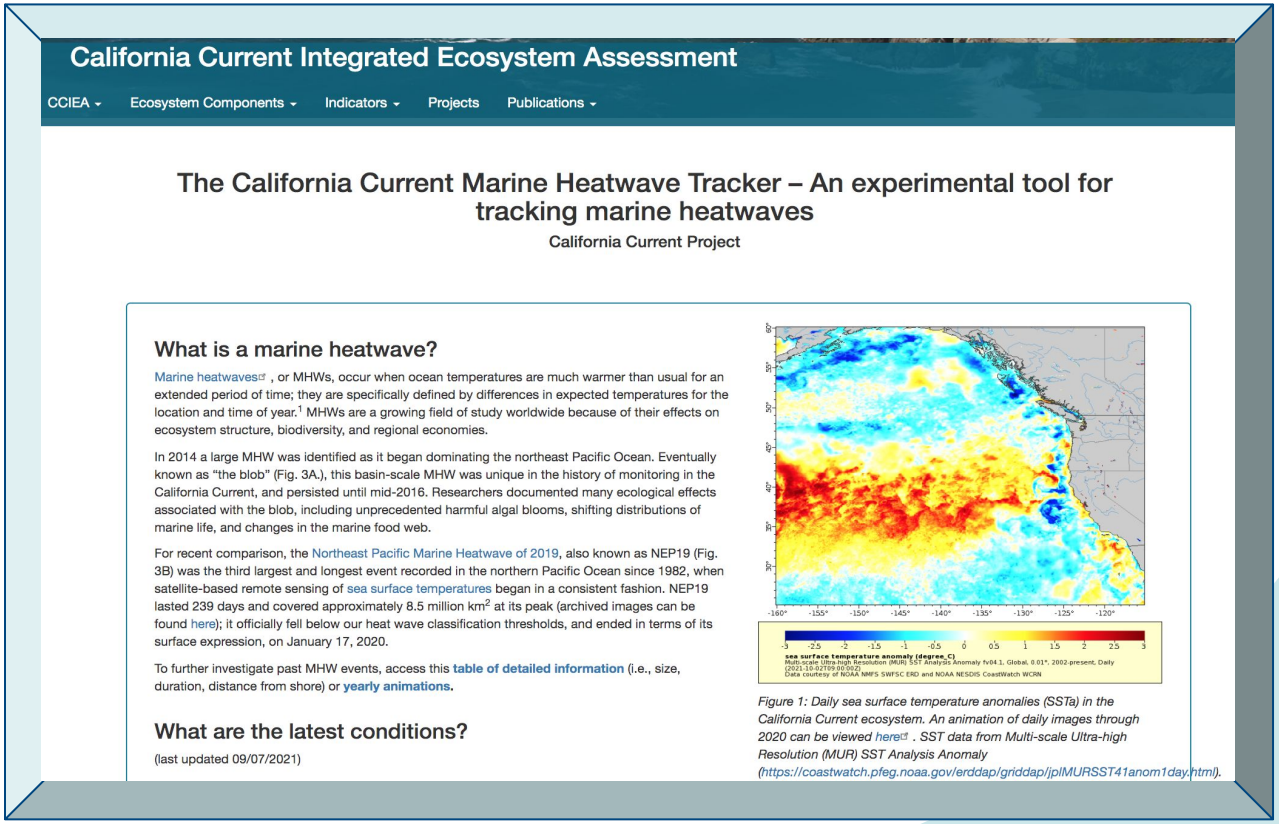


Figure 1: Daily sea surface temperature anomalies (SSTa) in the California Current ecosystem. An animation of daily images through 2020 can be viewed here . SST data from Multi-scale Ultra-high Resolution (MUR) SST Analysis Anomaly (https://coastwatch.pfeg.noaa.gov/erddap/griddap/jplMURSST41anom1day.html).

100% hinges on SST data from NOAA’s OISST dataset.

https://www.ncdc.noaa.gov/oisst/optimum-interpolation-sea-surface-temperature-oisst-v21

Products used by management: PFMC
(Pacific Fisheries Management Council)

2. Climate and Ocean Drivers

Isaac D. Schroeder, Steven Bograd, Jennifer Fisher, Toby Garfield, Correigh Greene, Elliott Hazen, Kym Jacobson, Michael Jacox, Isaac Kaplan, Andrew Leising, Stuart Munsch, Emily Norton, Dan Rudnick, Jarrod Santora, Samantha Siedlecki

Following the exceptionally warm and variable climate conditions of 2013-19, in 2020 conditions returned to those more favorable to higher productivity. The relatively weak 2019 El Niño shifted into the La Niña state and the positive PDO became negative. These trends suggest cooler waters and higher productivity. On the other hand, the NPGO remained strongly negative, an indication of reduced transport of North Pacific gyre water into the CCE and lower productivity.

The northeast Pacific continues to experience large marine heatwaves in surface waters. In January 2020, a heatwave that began in summer 2019 had receded to an offshore region in the Gulf of Alaska. A new heatwave occurred from February-June 2020 in the area where the 2019 event faltered, but it remained >1500 km from the West Coast. Then, a much larger heatwave formed offshore in June, and by mid-September it had grown to its maximum size of ~9.1M km² (Figure 3.1.2), the second largest North Pacific heatwave on record behind the 2013-2016 "Blob" (Appendix D.2). The 2020 heatwave stayed offshore until September, presumably held off by moderate to strong upwelling that occurred in the central and northern CCE for much of 2020. The heatwave lingered in coastal waters through November, particularly the northern CCE, then moved offshore, where it remains as of January 2021.

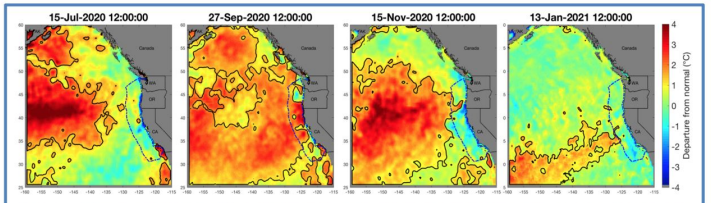


Figure 3.1.2 Progression of the 2020 marine heatwave. Colors represent standardized SST anomalies. Dark contours denote regions that meet the criteria for a marine heatwave (see Appendix D.2). Dashed line denotes EEZ boundary.

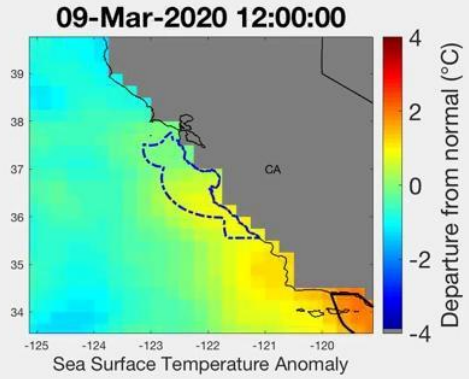
Example text and figures from last years report

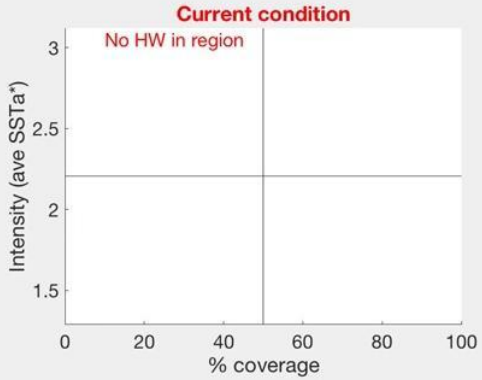
Data and Analyses used in annual report presented to the PFMC -> is used to "set the stage" as part of our "Integrated Ecosystem Assessment" -> from "wind to whales"

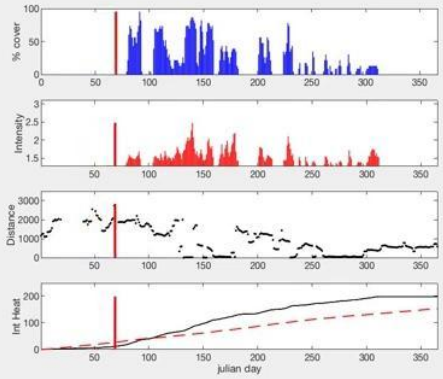
Website provides up-to-date information for council members or other stakeholders to view as the year progresses

Products for Management: NMS

Developed several indices based on discussions with NOAA-National Marine Sanctuaries staff, which they used in their 10 year condition status reports







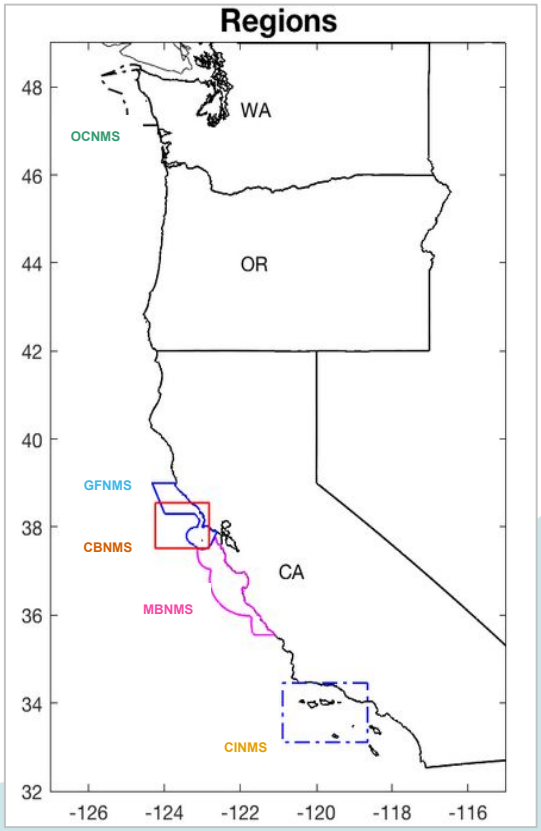
Heatwave data for region (blue dash line on map)

Heatwave outlined by thick black line (when present)

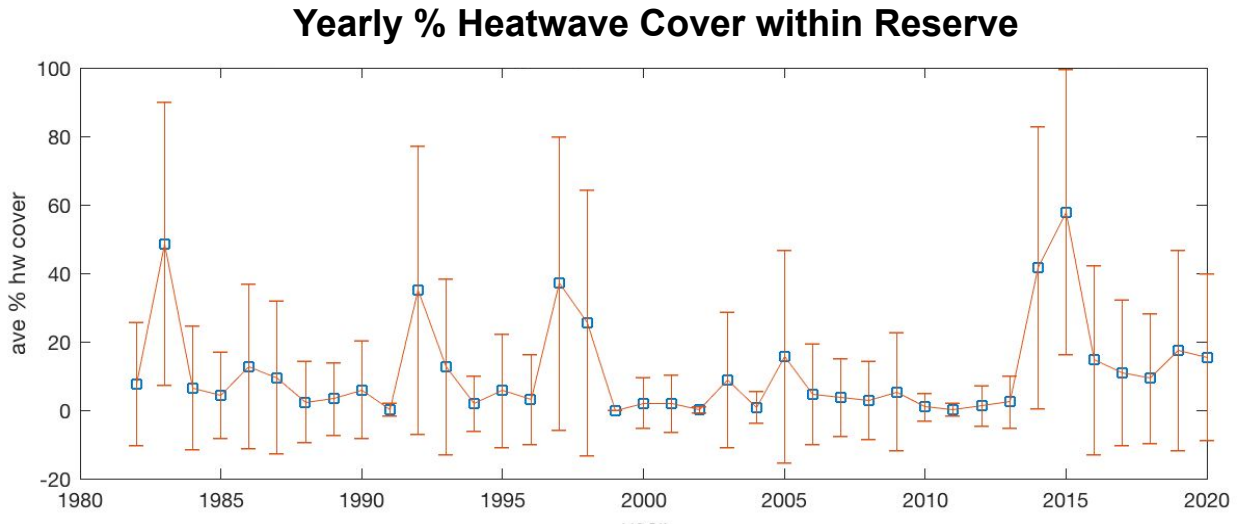
Data from NOAA OISST dataset

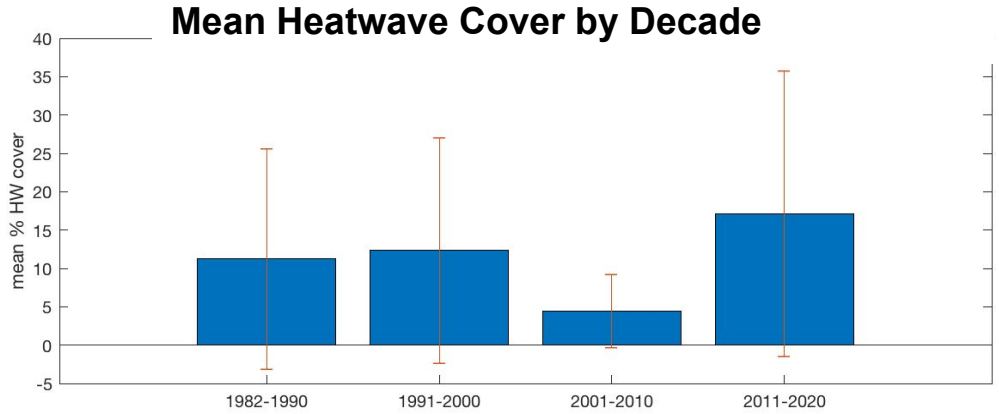
Top right panel =
Current % Region HW coverage vs
ave intensity of HW in region

Left panels =
1 = HW coverage of region over time (%)
2 = Intensity of HW over time (SSTa*)
3 = Distance to closest Major HW (km)
4 = Cumulative Intensity in region (black line)
and climatological Cumulative Intensity (red dash line)



Products for Management: NMS





Example indices used for sanctuaries condition report

Products for Management: CA EPA

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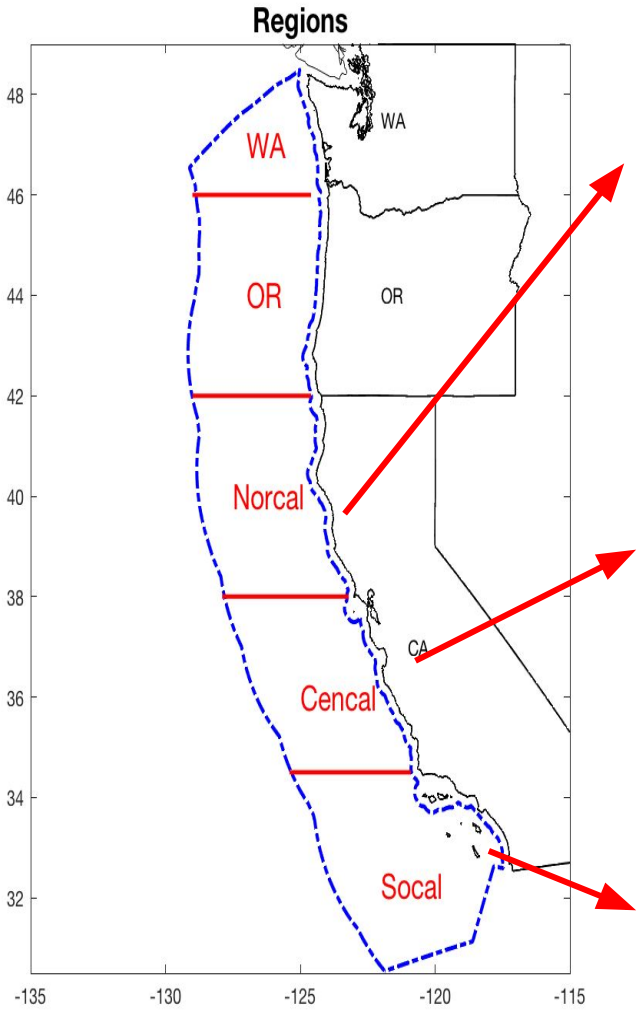
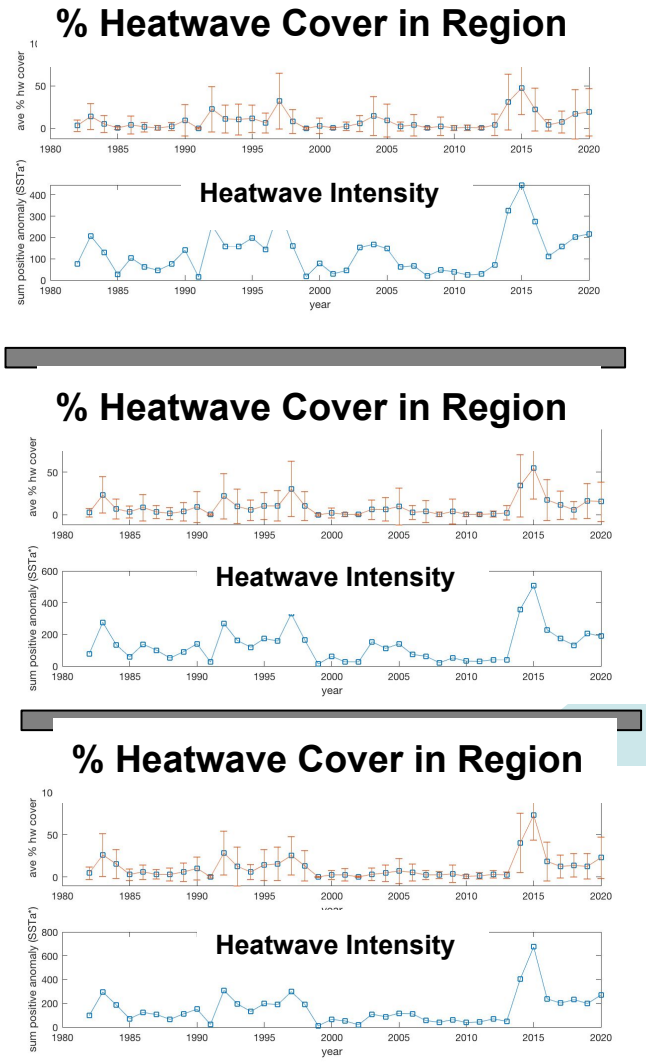
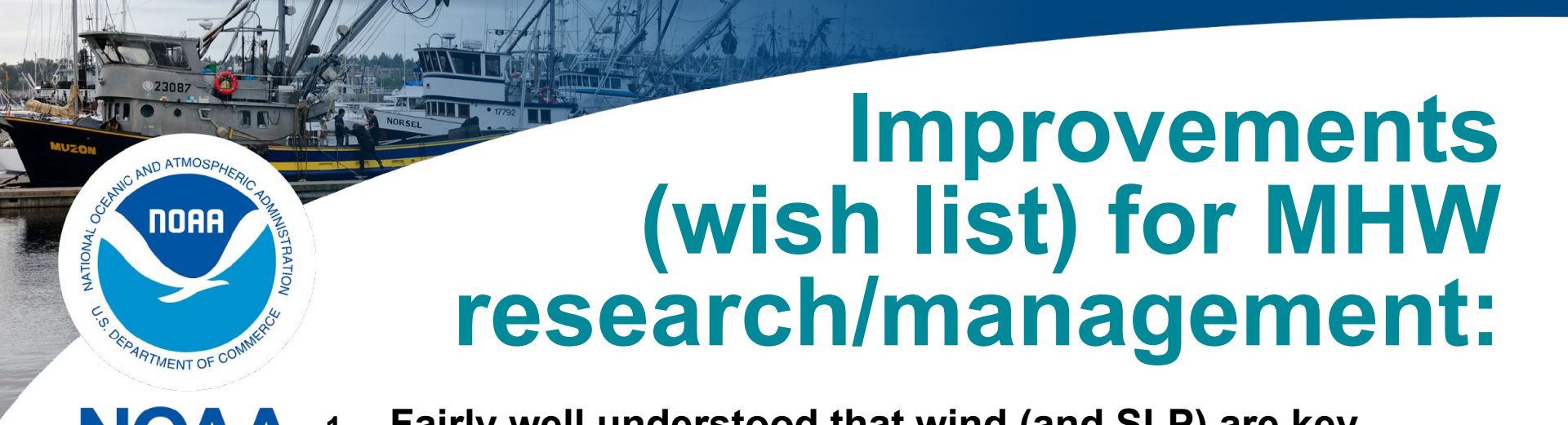
California EPA prepares a report every 3 years that includes a “marine conditions” section.

For the most recent report, they included several MHW indices as part of their report.







Improvements (wish list) for MHW research/management:

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1. Fairly well understood that wind (and SLP) are key co-indicators of MHWs, however, the data sources for them are not as easy to obtain/work with

1. The OISST dataset is delayed by several weeks
   - either fixing that delay, or creating other similar datasets that are daily, no gaps, etc. would be great!

1. The pathways from index creation to use for management is not always clear

1. Increased discussion with stakeholders to improve web-based products